# Asphalt Additive

## Hybrid Process

### Environmental Product Declaration

Date of Issue: 10/25/2024
Date of Expiration: 10/25/2029

PRODUCT CATEGORY RULE
ISO 21930 (2017). Sustainability in buildings and civil engineering works – Core rules for environmental product declarations of construction products and services.

FUNCTIONAL UNIT
1 kg of asphalt additive

# Program Operator Information

| | |
|---|---|
| Program Operator | ASTM International<br>100 Barr Harbor Dr., West Conshohocken, PA 19428<br>cert@astm.org |
| Manufacturer Name and Address | Driven Plastics<br>1107 S Santa Fe Ave Suite A, Pueblo, CO 81006 |
| Declaration Number | EPD826 |
| Product and Declared Unit | 1 kg of asphalt additive |
| Reference PCR and Version Number | ISO 21930:2017 Sustainability in Building Construction – Environmental Declaration of Building Products |
| Product's intended Application and Use | Asphalt in residential, commercial, and public works |
| Product RSL | Not Applicable |
| Markets of Applicability | United States |
| Date of Issue | 10/25/2025 |
| Period of Validity | 5 years from date of issue |
| EPD Type | Product Specific |
| EPD Scope | Cradle to Gate |
| Year of reported manufacturer primary data | 2023 |
| LCA Software and Version Number | LCA for Experts 10.8 |
| LCI Database and Version Number | Sphera MLC CUP 2024.1 |
| LCIA Methodology and Version Number | IPCC AR6, TRACI 2.1 |
| Independent verification of the declaration and data, according to ISO 14025: 2006, ISO 21930:2017, and the PCR.<br>☐ Internal ☒ External | Thomas Gloria, Ph.D., Industrial Ecology Consultants |
| This life cycle assessment was conducted in accordance with ISO 14044 and the reference PCR by: | WAP Sustainability Consulting |

Limitations:

- Environmental declarations from different programs (ISO 14025) may not be comparable.
- Only EPDs prepared from cradle-to-grave life-cycle results and based on the same function, reference service life, and quantified by the same functional unit, and meeting all the conditions in ISO 14025, Section 6.7.2, can be used to assist purchasers and users in making informed comparisons between products.
- Full conformance with the PCR for Products allows EPD comparability only when all stages of a life cycle have been considered. However, variations and deviations are possible. Example of variations: Different LCA software and background LCI datasets may lead to differences results for upstream or downstream of the life cycle stages declared.
- Additional information on the life cycle assessment can be found by contacting the manufacturer directly www.drivenplastics.com

# Declaration of General Information

## Company Description

Driven Plastics is a pioneering manufacturer of recycled polymer flake (RPF) for the asphalt industry. Recognizing the importance of both circular economy principles and mitigation of climate change, Driven Plastics is working towards providing low-carbon products for roadways.

## Product Description and Intended Use

The product under assessment combines recycled polymer flake (RPF) with ELVALOY™[1] Reactive Elastomeric Terpolymer (RET) as an additive for polymer modification of asphalt binder in hot mix asphalt (HMA) production. Initially, RET is blended with a base binder by Polymer Modified Asphalt (PMA) manufacturers to meet specific engineering requirements for various asphalt binder grades. The RET-modified PMA is then mixed with dry-fed RPF and aggregate at the HMA plant according to a mix design that adheres to both volumetric and performance specifications.

For paving applications, polymer modification improves resistance to both rutting and cracking, more commonly used for higher traffic loads and/or slow or static traffic. Also, it is useful for climatic regions with more extreme temperature ranges. Consequently, it is used throughout North America and globally.

No regulated substances of very high concern are present in the mixes assessed.

*Table 1: Product composition*

| | Hybrid | Post-Consumer Recycled Content |
|---|---|---|
| Recycled polymer flake | 86% | 100% |
| Compatibilizer (ELVALOY™ RET) | 14% | - |

## Manufacturing

RPF is created by grinding post-consumer polyethylene plastic waste. During this proprietary process, the plastic is fed into a mechanical system that generates heat and steam as byproducts, along with the RPF. A skilled technician oversees the operation to ensure it follows strict Quality Assurance/Quality Control (QA/QC) protocols. Any material that doesn't meet specifications is either recycled back into the system or sent to landfills.

[1] Trademark of The Dow Chemical Company ('Dow') or an affiliated company of Dow

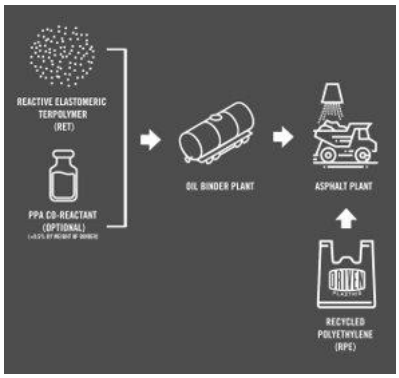


*Figure 1: Block Flow Diagram of Full Wet (L) and Hybrid (R) processes*

The raw materials for the RPF product are obtained locally from businesses and the City of Pueblo, CO.

## Packaging

Driven Plastics currently only reuses packaging from their upstream suppliers and therefore no impacts are attributed to the packaging.

# Declaration of the Methodological Framework

## Type of EPD and Declared Unit

This EPD is a Cradle-to-Gate EPD and includes the sourcing of raw materials, transportation of raw materials to the manufacturing facility.

The declared unit is 1 kg of asphalt additive.

## System Boundary

| Production | | | Construction | | Use | | | | | | | End of Life | | | | Benefits & Loads Beyond System Boundary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A1 | A2 | A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | B6 | B7 | C1 | C2 | C3 | C4 | D |
| Raw Material Supply | Transport | Manufacturing | Transport to Site | Assembly/Install | Use | Maintenance | Repair | Replacement | Refurbishment | Operational Energy Use | Operational Water Use | Deconstruction | Transport | Waste Processing | Disposal | Reuse, Recovery, Recycling Potential |
| X | X | X | MND | MND | MND | MND | MND | MND | MND | MND | MND | MND | MND | MND | MND | MND |

Construction of the facility, maintenance and construction of operational equipment, and any personnel related activity, such as transport, are excluded.

## Allocation Procedure and Cut-off Procedure

General principles of allocation for the LCA were based on ISO 14040/44. There are no products other than the synthetic granulates produced as part of the manufacturing processes studied in the LCA. Since there are no co-products, no allocation based on co-products is required.

To derive a per-unit value for manufacturing inputs such as electricity, thermal energy, and water, allocation based on total production by mass was adopted. As a default, secondary LCA for Experts datasets use a physical mass basis for allocation.

Of relevance to the defined system boundary is the method in which recycled materials were handled. Throughout the study, recycled materials were accounted for via the cut-off method. Under this method, impacts and benefits associated with the previous life of the raw materials from recycled stock are excluded from the system boundary. Hence no impacts arise from secondary materials used as raw materials for the manufacture of synthetic gravel. The study does include the impacts associated with reprocessing and preparation of the recycled materials that are used as raw materials.

Material inputs greater than 1% (based on total mass of the final product) were included within the scope of analysis. Material inputs less than 1% were included if sufficient data was available to warrant inclusion and/or the material input was thought to have significant environmental impact. Cumulative excluded material inputs and environmental impacts are less than 5% based on total weight of the functional unit.

## Results - Declaration of Environmental Indicators Derived from LCA

The environmental indicators required by the PCR are specified by the table below.

| Abbreviation | Indicator | Unit |
|---|---|---|
| | Impact | |
| GWP | Global warming potential, 100 years, excluding biogenic carbon | kg $CO_2$ eq |
| ODP | Ozone depletion potential | kg CFC 11 eq |
| EP | Eutrophication potential | kg N eq |
| AP | Acidification potential | kg $SO_2$ eq |
| SFP | Smog formation potential | kg $O_3$ eq |
| ADP-fossil | Abiotic depletion potential for fossil resources | MJ, net calorific value |
| | Resource Use | |
| $RPR_E$ | Use of renewable primary energy excluding renewable primary energy resources used as raw materials | MJ, net calorific value |
| $RPR_M$ | Use of renewable primary energy resources used as raw materials | MJ, net calorific value |
| $NRPR_E$ | Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials | MJ, net calorific value |
| $NRPR_M$ | Use of non-renewable primary energy resources used as raw materials | MJ, net calorific value |
| SM | Use of secondary materials | kg |
| RSF | Use of renewable secondary fuels | MJ, net calorific value |
| NRSF | Use of non-renewable secondary fuels | MJ, net calorific value |
| RE | Recovered energy | MJ, net calorific value |
| FW | Net use of fresh water | $m^3$ |
| | Waste Categories | |
| HWD | Hazardous waste disposed | kg |
| NHWD | Non-hazardous waste disposed | kg |
| HLRW | High-level radioactive waste, conditioned, to final repository | *kg* |
| ILLRW | Intermediate- and low-level radioactive waste, conditioned, to final repository | *kg* |
| | Output Flows | |
| CRU | Components for reuse | kg |
| MR | Materials for recycling | kg |
| MER | Materials for energy recovery | kg |
| EE | Exported energy | MJ |

## Production A1-A3

Production results are presented in the following tables for the product under study.

| Product ID: | | Hybrid |
|---|---|---|
| Impacts | Unit | A1-A3 |
| IPCC AR6 | | |
| GWP | kg $CO_2$ eq | 9.50E-01 |
| TRACI 2.1 | | |
| ODP | kg CFC-11 eq | 2.69E-08 |
| AP | kg $SO_2$ eq | 2.01E-03 |
| EP | kg N eq | 9.55E-04 |
| SFP | kg $O_3$ eq | 3.09E-02 |
| $ADP_F$ | $MJ_{NCV}$ | 2.47E+00 |
| Resource Use | | |
| $RPR_E$ | $MJ_{NCV}$ | 9.83E-01 |
| $RPR_M$ | $MJ_{NCV}$ | 2.26E-01 |
| $NRPR_E$ | $MJ_{NCV}$ | 7.06E+00 |
| $NRPR_M$ | $MJ_{NCV}$ | 1.26E+01 |
| SM | kg | 8.60E-01 |
| RSF | $MJ_{NCV}$ | 0.00E+00 |
| NRSF | $MJ_{NCV}$ | 0.00E+00 |
| RE | $MJ_{NCV}$ | 0.00E+00 |
| FW | $m^3$ | 1.14E-03 |
| Output Flows | | |
| HWD | kg | 6.65E-02 |
| NHWD | kg | 1.18E-01 |
| HLRW | kg | 1.72E-08 |
| ILLRW | kg | 1.48E-05 |
| CRU | kg | 0.00E+00 |
| MR | kg | 3.73E-05 |
| MER | kg | 0.00E+00 |
| EE | MJ | 0.00E+00 |

# Additional Environmental Information

## Environment and Health During Manufacturing

The environmental and health considerations during RPF manufacturing are quite low. Since the process is a mechanical process rather than chemical the largest health issue is dust and large particulates in the air. This problem is controlled by a vent system (currently being constructed) and by employee PPE. The PPE includes respirators which are mandatory during manufacturing.

## SDS Documentation

For additional information on RPF and Elvaloy the SDS is included on the website (https://www.drivenplastics.com/tech-resources) or Driven Plastics can be directly contacted as well (https://www.drivenplastics.com/contact)

# References


IPCC. (2021). Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. [Masson-Delmotte, V., P. Zhai, A. Pirani, S.L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M.I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J.B.R. Matthews, T.K. Maycock, T. Waterfield, O. Yelekçi, R. Yu, and B. Zhou (eds.)]. Cambridge University Press. In Press.

ISO 14040: 2006/Amd 1:2020 Environmental Management - Life cycle assessment – Principles and framework.

ISO 14044: 2006/Amd 2:2020 Environmental Management - Life cycle assessment - Requirements and Guidelines

ISO 14025:2006 Environmental labels and declarations – Type III environmental declarations – Principles and Procedures.

ISO 21930:2017 Sustainability in buildings and civil engineering works – Core rules for environmental product declarations of construction products and services.

TRACI: The Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts. Version 2.1 – User Guide - https://nepis.epa.gov/Adobe/PDF/P100HN53.pdf.